## AMENDMENTS TO THE CLAIMS

Please amend claim 1, 22, and 27, as set forth in the listing of claims that follows:

1. (Currently Amended) A method for detecting a concentration of soot particles in engine oil comprising the steps of:

applying a microwave signal having a frequency ~~within a range of frequencies~~ to one end of a transmission line having a probe tip at a second end of the transmission line and varying the frequency of the microwave signal within a range of frequencies, the probe tip being exposed to the engine oil;

detecting a probe voltage at a stationary detection point along an axial length of the transmission line for selected frequencies within the range of frequencies;

determining a probe frequency of the selected frequencies when the probe voltage is equal to a null voltage of a standing wave within the transmission line;

comparing the probe frequency to a probe reference frequency, wherein the probe reference frequency is a frequency of the microwave signal when the probe voltage is equal to a null voltage for a known concentration of soot particles in the engine oil; and

calculating the concentration of soot particles in the engine oil based upon a result of the comparing step.

2. (Original) The method according to claim 1 wherein the step of applying a microwave signal further comprises the step of applying a microwave signal having an X-band frequency to the one end of the transmission line.

3. (Original) The method according to claim 1 wherein the step of applying the microwave signal further comprises the step of:

generating the frequency using a variable-frequency oscillator.

4. (Original) The method according to claim 3, further comprising the step of:

applying a voltage within a range of voltages to a varactor diode of the variable-frequency oscillator wherein each voltage within the range of voltages results in a microwave signal having a unique one of the selected frequencies within the range of frequencies.

5. (Original) The method according to claim 4 wherein the probe frequency is represented by a first voltage applied to the varactor diode, and wherein the probe reference frequency is represented by a reference voltage, the reference voltage being a voltage applied to the varactor diode when the probe voltage is equal to the null voltage for the known concentration of soot particles in the engine oil.

6. (Original) The method according to claim 5 wherein the comparing step comprises the steps of calculating a difference of the first voltage and the reference voltage and dividing the difference by the null voltage of the standing wave within the transmission line.

7. (Original) The method according to claim 6 wherein the step of calculating the concentration of soot particles in the engine oil comprises the step of:

comparing a result of the dividing step with a plurality of known values corresponding to known concentrations of soot particles.

8. (Original) The method according to claim 3, further comprising the step of:

applying a ramp voltage signal to a varactor diode of the variable-frequency oscillator, wherein each voltage in the ramp voltage signal results in a microwave signal having a unique one of the selected frequencies within the range of frequencies.

9. (Original) The method according to claim 8 wherein the ramp voltage signal starts at a high value and ends at a low value, wherein the high value and the low value define the range of voltages.

10. (Original)The method according to claim 8 wherein the step of determining the probe frequency comprises the step of determining a first ramp voltage when the probe voltage is equal to the null voltage of the standing wave within the transmission line; and wherein the step of comparing the probe frequency to the probe reference frequency comprises the step of comparing the first ramp voltage to a probe reference voltage, the probe reference voltage being a voltage applied to the varactor diode that results in the probe reference frequency.

11. (Original)The method according to claim 10 wherein the step of comparing the first ramp voltage to the probe reference voltage comprises the steps of calculating a difference of the first ramp voltage and the probe reference voltage and dividing the difference by the null voltage of the standing wave within the transmission line.

12. (Original)The method according to claim 11 wherein the step of calculating the concentration of soot particles in the engine oil comprises the step of:

comparing a result of the dividing step with a plurality of known values corresponding to known concentrations of soot particles.

13. (Original)The method according to claim 1, further comprising the step of:

determining the probe reference frequency at a point when the known concentration of soot particles is zero.

14. (Original)The method according to claim 1 wherein the calculating step further comprises the step of comparing a result of the comparing step with a plurality of known values corresponding to known concentrations of soot particles.

15. (Original)The method according to claim 1 wherein the step of applying the microwave signal having the frequency within the range of frequencies further comprises the step of applying the microwave signal to one end of a reference probe having a short at a second end of the reference probe, the method further comprising the steps of:

detecting a reference probe voltage at a stationary detection point along an axial length of the reference probe for the selected frequencies within the range of frequencies;

determining a reference probe frequency of the selected frequencies when the reference probe voltage is equal to a null voltage of a standing wave within the reference probe;

comparing the reference probe frequency to a reference probe reference frequency, wherein the reference probe reference frequency is a frequency of the microwave signal when the probe voltage is equal to a null voltage for the known concentration of soot particles in the engine oil; and

compensating for temperature variations in the first probe frequency using an output of the comparing step and a calibration factor.

16. (Original)The method according to claim 15 wherein the calibration factor is a difference between the probe reference frequency and the reference probe reference frequency.

17. (Original)The method according to claim 15, further comprising the steps of:

determining the probe reference frequency at a point when the known concentration of soot particles is zero;

determining the reference probe reference frequency at the point when the known concentration of soot particles is zero; and

calculating the calibration factor by comparing the probe reference frequency to the reference probe reference frequency.

18. (Original)The method according to 15, further comprising the step of:

applying a voltage within a range of voltages to a varactor diode of a variable-frequency oscillator wherein each voltage within the range of voltages results in a microwave signal having a unique one of the selected frequencies within the range of frequencies.

19. (Original)The method according to claim 18 wherein a first probe voltage applied to the varactor diode represents the probe frequency; wherein a first reference probe voltage applied to the varactor diode represents the reference probe frequency; wherein a probe reference voltage represents the probe reference frequency, the probe reference voltage being a voltage applied to the varactor diode when the probe voltage is equal to a null voltage for the known concentration of soot particles in the engine oil; and wherein a reference probe reference voltage represents the reference probe reference frequency, the reference probe reference voltage being a voltage applied to the varactor diode when the reference probe voltage is equal to a null voltage for the known concentration of soot particles in the engine oil.

20. (Original)The method according to claim 18, further comprising the step of:

applying a ramp voltage signal to the varactor diode of the variable-frequency oscillator, the ramp voltage signal starting at a high value and ending at a low value, wherein each voltage in the ramp voltage signal results in a microwave signal having a unique one of the selected frequencies within the range of frequencies.

21. (Original)The method according to claim 20 wherein a null point of a standing wave within the reference probe is reached at a higher ramp voltage than a null point of a standing wave within the probe at any concentration of soot particles in the engine oil.

22. (Currently Amended) An apparatus for detecting a concentration of soot particles in engine oil comprising:

means for applying a microwave signal having a frequency ~~within a range of frequencies~~ to one end of a transmission line having a probe tip at a second end of the transmission line and for varying the frequency within a range of frequencies, the probe tip being exposed to the engine oil;

means for detecting a probe voltage at a stationary detection point along an axial length of the transmission line for selected frequencies within the range of frequencies;

means for determining a probe frequency of the selected frequencies when the probe voltage is equal to a null voltage of a standing wave within the transmission line;

means for comparing the probe frequency to a probe reference frequency, wherein the probe reference frequency is a frequency of the microwave signal when the probe voltage is equal to a null voltage for a known concentration of soot particles in the engine oil; and

means for calculating the concentration of soot particles in the engine oil based upon a result of the comparing step.

23. (Original)The apparatus according to claim 22 wherein the means for applying a microwave signal comprises a variable-frequency oscillator.

24. (Original)The apparatus according to claim 23 wherein the variable-frequency oscillator is operable to apply microwave signals in a band higher than the X-band.

25. (Original)The apparatus according to claim 23, further comprising:

a reference probe having a short circuit at a first end, a second end of the reference probe operably connectable to the variable-frequency oscillator such that the microwave signal applied to the transmission line is simultaneously applied to the reference probe;

means for detecting a reference probe voltage at a second stationary detection point along an axial length of the reference probe for the selected frequencies within the range of frequencies;

means for determining a reference probe frequency of the selected frequencies when the reference probe voltage is equal to a null voltage of a standing wave within the reference probe;

means for comparing the reference probe frequency to a reference probe reference frequency, wherein the reference probe reference frequency is a frequency of the microwave signal when the probe voltage is equal to a null voltage for the known concentration of soot particles in the engine oil; and

means for compensating for temperature variations in the first probe frequency using an output of the comparison and a calibration factor.

26. (Original)The apparatus according to claim 25 wherein the means for detecting the probe voltage further comprises a diode detector located at the stationary detection point along the axial length of the reference probe; and wherein the means for detecting the reference probe voltage further comprises a second diode detector located at the second stationary detection point along the axial length of the reference probe.

27. (Currently Amended) The apparatus according to claim 23 ~~22~~ wherein the variable-frequency oscillator comprises a varactor diode operable to receive a voltage within a range of voltages, wherein each voltage within the range of voltages results in a microwave signal from the variable-frequency oscillator having a unique one of the selected frequencies within the range of frequencies.

28. (Original)The apparatus according to claim 27 wherein the probe frequency is represented by a first voltage applied to the varactor diode, and wherein the probe reference frequency is represented by a reference voltage, the reference voltage being a voltage applied to the varactor diode when the probe voltage is equal to the null voltage for the known concentration of soot particles in the engine oil.

29. (Original)The apparatus according to claim 28 wherein the means for comparing comprises means for calculating a difference of the first voltage and the reference voltage and means for dividing the difference by the null voltage of the standing wave within the transmission line.

30. (Original)The apparatus according to claim 29 wherein the means for calculating the concentration of soot particles in the engine oil comprises means for comparing a result of the dividing step with a plurality of known values corresponding to known concentrations of soot particles.

31. (Original)The apparatus according to claim 22 wherein the means for detecting a probe voltage further comprises a single, stationary diode detector.